

5.0 POTENTIAL CUMULATIVE AND LONG-TERM IMPACTS

This section evaluates the impacts from the proposed action and alternatives in conjunction with other actions that could result in a cumulative impact to the environment. Cumulative impacts are defined as "...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Impacts are considered on a cumulative basis because of individual minor direct and indirect effects of multiple actions that occur over the history of the site. Cumulative impacts are to be considered over the "lifetime" of the impacts, rather than only the duration of the action.

Past and current impacts were evaluated in **Section 4.0** using Alternative 2 - No Action as a baseline for comparison against the proposed action (Increase soil radionuclide planning levels from 4 to 10 mrem/yr and allow the discharge of treated, WETF effluents into the Y-12 and City of Oak Ridge sewer systems) and Alternative 1 (Increase soil radionuclide planning levels from 4 to 10 mrem/yr but not allow discharge of WETF effluents into the sewer system). Other actions with similar potential effects to the proposed action could act synergistically or incrementally with the effects discussed in **Section 4.0**, thereby increasing the potential adverse or beneficial impacts on a cumulative basis. The potential effects of implementing the Proposed Action or Alternative 1 are combined with potential impacts from other projects for consideration of cumulative impacts by resource area in this section. If a resource area would not be affected as a result of taking an action, it is assumed that there would be no cumulative impact potentially resulting from the action.

Identification of other actions that could result in cumulative impacts when combined with the proposed action is based on actions likely to have similar potential impacts within the same geographic area and over the same time frame. Because application sites utilized in the Biosolids Land Application Program were selected in presumably clean areas of the ORR that were physically isolated from other ORR plant operations, the active application sites are not located within the footprint of any other on-going projects at the time of this EA. Because the majority (i.e., five) of the sites are in the general vicinity of the Y-12 plant, it is possible that some of the environmental restoration projects and modernization of the Y-12 Plant could be considered in this cumulative impacts section. Local projects that could have cumulative impacts with the proposed action include a proposed connector highway from I-40 in Roane County to Oak Ridge.

5.1 Cumulative Impacts by Resource Area

Geology and Soils

The ORR covers 13,912 ha (34,424 acres). There are six active land application sites totaling 133 ha (329 acres) on the ORR (**Table 1.1** and **Figure 1.1**). Three previously utilized sites totaling 21 ha (52 acres) are currently inactive. The active sites represent approximately 1% of the total area of the ORR. The size of application sites ranges from 10.9 ha (27 acres) to 47.4 ha (117 acres).

The lifetime application site loading limits, ceiling concentrations for heavy metals and radionuclides and the comprehensive monitoring program are designed to prevent future land use restrictions and remedial actions from being placed on any sites used for land application of biosolids. The safety factor provided by the specific limits derived from the TDEC-approved, dose-based approach ensures protection of the environment.

Implementation of the proposed action and Alternative 1 would contribute to a slight increase in the radionuclide loading for ORR Biosolids Land Application Site soils. **Appendix B, Tables B.5** through **B.11** summarize cumulative loading of inorganics, heavy metals, organics, radionuclides, respectively, on active ORR biosolids application sites. Cumulative impacts involving biosolids land application for heavy metals, inorganic constituents and organic compounds have been previously evaluated (DOE 1996) and found to not be important and will not be further discussed in this section. These tables give an indication of how minimal the cumulative impacts would be. For example, city biosolids radionuclide concentrations are well below the dose-based planning levels in the proposed actions, and only represent a maximum of 20% of the proposed biosolids planning level for Cobalt-60. In addition, after 12 years of operation involving the land application of city biosolids, radionuclide concentrations within ORR soils are at an average of 8% of existing planning levels. Because the average remaining life of the ORR land application sites is estimated to be 7 years, it is expected that only approximately 47.1% of the proposed 10 mrem/yr soil planning levels will be realized. This is demonstrated by the predictive modeling results (**Appendix E**) listed in **Table 4.2** for the existing sites. Therefore, it can be concluded that the probability that ORR biosolids land application site soils will ever fully achieve radionuclide concentrations that correlate to the proposed level of 10 mrem/yr is extremely low and unlikely. In the unlikely event that ORR application sites ever achieve the proposed radionuclide planning levels, the associated risk to an on-site resident is still below the acceptable EPA and DOE risk value of 10^{-4} .

No soils will be removed or excavated from the active application sites in conjunction with Y-12 environmental restoration projects or the modernization of the Y-12 Plant. In addition there are no construction activities planned now or in future operations for these sites; therefore, no potential cumulative effects from the proposed action or Alternative 1 were identified.

Water Resources

Implementation of the proposed action or Alternative 1 would not contribute to the cumulative impact on the surface water and groundwater of the ORR or surrounding communities. Under the proposed action, treated WETF wastewaters would be discharged to the Y-12 and City of Oak Ridge sewer systems where they would receive additional treatment at the city POTW and then be discharged into lower EFPC. *Appendix H, Table H.6.* demonstrates that the total chemical and radiological risk from this discharge scenario would actually be less than that of Alternative 1 or 2, direct treatment by the WETF Effluent Polishing System (EPS) and discharge to upper EFPC. WETF discharges to upper EFPC represents less than 1% of the total average flow and is not expected to augment the physical flow of the creek.

There are no major streams, lakes or bodies of water found on the ORR Biosolids Land Application Sites. There are a few small ponds that have been marked and identified by wetlands flagging. These areas are protected by a 500 foot buffer zone that prohibits the application of biosolids. Because the physical state of the biosolids has been converted from liquid to solid and the material has been sterilized (i.e., no pathogens), the biosolids material being land-applied poses little to no threat for surface water runoff. Radionuclides are bound to the solid matrix of the biosolids and are not readily released when the material becomes wet and begins to incorporate into the site soils. For this same reason, groundwater will also not be impacted. The city is required to calculate the quantity of biosolids that can be applied on a given site based upon previous applications, what the growth requirements of the vegetation are required and the level of nitrogen found in the biosolids each year. Using this formula, biosolids application is limited for each site, protecting the ORR groundwater.

The proposed action and Alternative 1 would not contribute to surface water discharges that could occur from Y-12 environmental restoration actions or the Y-12 Plant Modernization Project. No groundwater withdrawals are planned as any part of the proposed action or Alternative 1. In addition, there should be no interaction between the proposed action, Alternative 1 and any environmental restoration actions involving groundwater recovery or discharge.

Negligible chemical or radiological impacts on groundwater or surface water are anticipated from the implementation of the proposed action or Alternative 1. Therefore, negligible cumulative impacts would be expected.

Ecological Resources

Implementation of the proposed action or Alternative 1 would have little effect on ecological resources (*Section 4.8.1*). No impacts to wetlands or threatened and endangered species were identified as a result of implementation of the proposed action and Alternative 1. The Y-12 Plant Modernization Project and Y-12 environmental restoration activities would also not impact wetlands and threatened and endangered species; therefore, ecological resources of the ORR should not be cumulatively impacted.

Cultural Resources

No prehistoric sites have been identified on the active ORR Biosolids Land Application sites. Therefore, the implementation of the proposed action or Alternative 1 would not contribute to cumulative effects on the archaeological resources of the ORR.

Air Quality

Because of the biosolids processing change at the city POTW, the physical state of the biosolids being land-applied went from liquid to solid. This change could result in the formation of dust particulates at the point of application. An air dispersion model (*Appendix I*) was formulated for the proposed action and Alternative 1 to simulate the on-site exposure of a person standing on a biosolids application site inhaling fugitive radioactive particulates downwind during application. Results are listed in *Table 4.4*.

The maximum exposure of an individual breathing the biosolids as they are land-applied 260 operational days per year, 8 hours each day is 0.00008 mrem/yr. This corresponds to 0.01% of the total 0.7 mrem/yr off-site exposure (ASER 2000) received by an individual from cumulative operations conducted on the ORR or any concurrent projects in and around the application sites that have the potential to produce dust emissions. Thus, the proposed action or Alternative 1 would not be expected to adversely impact air quality in and around the ORR.

Socioeconomic

Environmental effects from the proposed action and Alternative 1 on the economy and community infrastructures of the ROI would be minimal. A total of \$133,000 per year would not be realized for WETF operations due to the inability to discharge treated effluents to the sewer system and there is a strong possibility that the city will no longer accept ORNL biosolids in the existing land application program, resulting in an additional \$67,000 per year for DOE. *This represents approximately 0.01% of Anderson County, 0.01% of Roane County, and 0.001% of Knox County 1999 personal income statistics (Appendix C, Table C.1), respectively.* Economic impacts could be more substantial if a commercial industry or government entity that required some level of radionuclide capacity, decided to relocate to the Oak Ridge Community and sewer capacity was not available. Because of the variety and size of industries, it is difficult to predict the economic impact upon the Oak Ridge Community due to the substantial number of unknown variables involved. It should be noted that if the proposed action or Alternative 1 were successfully implemented, it could contribute indirectly to sustained or increased numbers of well-paying jobs within the OR region over the long-term, particularly when considered in combination with other actions and initiatives, e.g., the Y-12 Plant Modernization Project, reindustrialization at ETTP and the development of a four-lane highway from I-40 in Roane County to Oak Ridge. However, at the present time, there are no industries that require sanitary sewer system radionuclide capacity, thus, there would be no cumulative impact or change to regional income, housing markets, or the demand for community services.

Environmental Justice

No potential effects to environmental justice were identified from the proposed action or Alternative 1 or for other projects with a potential to contribute to cumulative effects. Therefore, there would be no cumulative effects on environmental justice.

Transportation

Implementation of the proposed action would not result in appreciable changes to commuter traffic since the number of long-term employees operating the city program would not change. Negligible increases in traffic would arise from employment of temporary workers, such as for construction, but no change in the level-of-service on-site or on nearby roads is expected to be needed on that basis. Traffic to the SNS site would be accommodated by an access road already being constructed as part of the SNS facility.

Increases in traffic could result from environmental restoration activities on ORR over the short term.

These would only exceed traffic levels in past years if all of these activities occurred concurrently.

Because access roads to the ORR Biosolids Land Application Sites are restricted from public use, there would be no cumulative change to demand for roadway access.

Land Use

The proposed action and Alternative 1 would not result in changes to land use because activities would occur on sites that have been in use since 1986 for biosolids land application activities. There would be no change in the total acreage. Although the sites have trace quantities of heavy metals and radionuclides that have been applied over the years of city operation, the levels of these contaminants are well within background levels observed from adjacent sites that have not received biosolids application.

Human Health and Safety

No operations included under the proposed action or Alternative 1 would increase chemical or radiological emission for the ORR Biosolids Land Application sites because operations would be the same or similar to the current operations. **Table 5.1** represents respective on-site exposures for individuals resulting from the proposed actions. Since the overall contribution of radionuclides from WETF is negligible (0.0014% life of each site), radiation doses receive on-site from each of the proposed actions are essentially the same.

Table 5.1. Cumulative On-Site Impacts from the Proposed Actions

Individual	Expected Dose (mrem/yr)
On-Site Resident	4.71
Worker	0.14
Transient	0.02

The generally very low levels have been confirmed by monitoring data showing no detection of radiation above background levels at any of the biosolids application sites surveyed (DOE 1996). Impacts to human health are evaluated in the land application site program risk assessment (*Appendix G*). Combined chemical and radiological risks to employees and transients are minimal and are below the acceptable DOE and EPA risk value (10^{-4}) for excess lifetime cancer risk and for nonradiological hazard. Cumulative human health impacts would be expected to be less than those described in the risk assessment for direct exposure to biosolids during or immediately after land application. TLD monitoring of employees has shown no important exposure to radionuclides (DOE 1996). As discussed in *Sections 4.1.5* and *Table 4.3*, off-site impacts to EFPC from the proposed actions are negligible.